

- e. Rates posted at 8:00 A.M. should remain in effect for twenty-four hours.
- f. Operators who do not satisfy court judgments for damages within a specified period should be closed down until judgment is satisfied.
- g. Operators must keep a record of license numbers of patrons for police inspection.
- h. Operators should not be allowed to move cars to other lots without the written consent of the owner.
- i. Operator, before given a license, must submit plans showing a parking layout of the lot, curb cuts, and gates. Each parking space should be defined.
- j. When the lot is full, a sign "Filled" must be displayed at the entrances.
- k. All loading and unloading should be done entirely on the lot, and sidewalks should not be blocked.
- l. Premises must be kept clean and free from dust.

Local conditions may prompt your city to add to the above restrictions.

Improved mass transportation in the form of busses, trolley cars, and trolley coaches help relieve the parking problem. This service in many instances can be made much more utilitarian and attractive, so as to induce the automobile owner to leave his car at home and thus decrease the demand for parking space. The average passenger car carries 1.75 persons, while the Fort Wayne trolley busses at peak hours now are carrying 90 to 100 passengers out of the downtown district. One trolley bus can therefore replace 50 autos, or the equivalent of 1,000 feet of curb parking space.

No set of rules will solve the parking problem for any city. Each city must solve its own problem. All cities should have a traffic survey made and a competent traffic engineer to work out as sane and enforceable a solution as possible. No community will ever solve its problem to the entire satisfaction of everyone. It must solve each problem as it comes up.

## OPERATIONS OF A COUNTY ROAD DEPARTMENT

George W. Koronski,

Superintendent and Engineer, Gogebic County Road  
Commission, Bessemer, Michigan

Michigan has 83 counties, 68 of which are south of the Straits of Mackinac and 15 in that territory known as the Upper Peninsula. This peninsula stretches 350 miles from east to west and about 195 miles from north to south. It is about half the size of the State of Indiana, from which you can see that the counties in the Upper Peninsula are quite large. I live approximately 100 miles west and 435 miles north of Chicago. Gogebic County borders on Lake Superior and is

as far from Detroit as is Philadelphia. It takes just as long for me to go to my state capital as it took me to come to Lafayette. My county, by road, from the southeast corner to the northwest corner is approximately 85 miles long and averages 25 miles wide.

The counties in the State of Michigan maintain all the township and county roads, and those with sufficient organizations (including mine) also contract with the State Highway Department for the maintenance of the state trunk lines.

We operate under what is known as the County Road Law, a law that was written and passed by far-sighted men in 1909 and that in my opinion could well be copied throughout the United States. The Board of Supervisors appoints a commission of three for terms of six years each, electing or appointing a commissioner every two years. This commission acts as an administrative body only and appoints a county engineer and a superintendent to have full charge of all the work in the county. In the more progressive counties the duties of the county engineer and the superintendent are vested in one man, known as the county engineer and superintendent or engineer manager, as he is sometimes called. This places the entire county road organization under one man who must be responsible to his administrative board. It removes the county engineer one more step from politics, which is so prevalent in our road work today. It tends to stabilize the county engineer's job so that in Michigan we have many county engineers, such as myself, who have been in our offices for twenty years or more. Needless to say, this would have been practically impossible if the county road law had been written in such a way as to allow the infiltration of politics as far as the personnel is concerned. I attribute the long terms of office to the fact that honest men in more permanent positions can do a far better job.

### *CONSTRUCTION*

In Gogebic County our grades are all built with 32-foot tops, 4-to-1 slopes, 2-foot, flat-bottom ditches and with the back slopes fitted into the remaining 66-foot right-of-way to meet the existing conditions. Additional right-of-way is provided in the heavier cuts if and when we have the money.

Crushed gravel was used in every case for the road metal. The grades are built to a high type of design with the ultimate goal of a higher-type surface. It is the concensus of opinion that the feathered-edge type of surface construction has an advantage over trenched surfaces. It is my opinion that there should never be a trench grade on a gravel road, since it has a tendency to disturb the compaction that takes place after shrinkage.

After the usual flat earth grade is built, the surface is smoothed with a power grader and given a slight crown. Much can be said about the base course, but there is one thing

of which we can most reasonably be sure—that as the base is, so is the surface. We must build the base first. It is my experience that a base course of less than 6 inches compacted cannot withstand the pounding of heavy loads or the severe test of an unusual spring breakup.

We build a compacted base of from 6 to 12 inches, depending on soil conditions. Because of our complicated soil conditions we have resorted to the cut-and-try method with a good deal of success. After the base course is placed on the crowned subgrade, it is allowed to stand for a year, or at least through one spring breakup. If any serious failure in the subgrade results, it is examined as to drainage, capillarity, or soil conditions. In most cases capillarity is the trouble, it is not always related to the soil itself, but is seemingly a factor of disturbed ground-water conditions. The spots affected are then dug out and filled with field stone, a method that has successfully carried all loads.

We have miles and miles of rock fences that are detrimental to snowplowing operations; so, wherever possible, we make what might be called rockfence fills according to the old macadam method of placing the larger boulders in the bottom and filling the interstices with small rocks. Our gravel base is placed on top of this stone layer. We have had no failures with that type of construction. In many cases we have been able to raise the roadbed above the level of the surrounding area, which makes snow removal easier.

The use of bank-run gravel for a base course depends entirely upon local conditions. We have enjoyed good success with bank-run material and even use it with the larger rocks raked out for surfacing our outlying roads. This gives a good all-weather surface for slow traffic. A 10- to 12-per-cent clay content in the base course ensures good compaction and assists in making the base course impervious to surface water.

Whenever possible a three-inch wearing course should be maintained consisting of crushed gravel passing a  $\frac{3}{4}$ -inch screen and containing 10 to 12 per cent of clay. But I have never attained that Utopia. A gravel road is built and then wears away at the rate of about an inch a year under heavy traffic and weather conditions. I have never seen enough resurfacing material available to keep up with the loss.

#### MAINTENANCE

After the engineers have done everything in their power to live up to the specifications, a gravel road is no better than its maintenance. The rideability of any gravel road will be determined by the amount of maintenance it receives through and just after the spring breakup period before the road has set. All gravel roads heave in the winter in a surprisingly uniform way and then settle back with a sigh as summer comes. It is during this settling period that a maximum amount of

dragging is needed to ensure a better rideability during the summer period. Where this maintenance is not possible because of surface or subgrade conditions, it will often be necessary to scarify the entire surface during the summer in order to give it again the desired rideability.

Sometimes, because of the rapidity with which the frost comes out of the ground, we are liable to have bad subgrade failures. It is well to anticipate these failures by almost hourly observations of the failing sections and by using the "planking method" before the traffic becomes hopelessly mired. This method of supporting traffic over a subgrade failure is well received by the public and pays big dividends to the automobile owner as well as to the rideability of the road during the succeeding summer. In many cases hundreds of cubic yards of maintenance gravel are wasted in patching failures that should have been planked. I do not believe enough thought has been given to this temporary relief during excessive spring breakup.

In snow districts, winging out the snow beyond the ditch line, undercutting the snow banks, especially during the first thaws, pays big dividends by bringing the normal ditch drainage into action more quickly and eliminating the puddling of the gravel surface.

Patching materials should always be conveniently at hand; and if the weather is dry, calcium chloride should be added to the patching material.

With the advent of high-speed traffic it is also very important to try to keep the road swept entirely clean of loose pebbles, not only because they are a hazard to automobile windshields but also because they act as abrasives on the surface of the road, causing excessive pitting. The more time we spend on dragging operations, the less need there is for patching and the better the road surface. A gravel road must be kept smooth. Chatter bumps must be combated continually, especially after a rain.

Dragging or floating operations vary from day to day, according to road and weather conditions. No set rule can be followed and no one-day criticism is justifiable. A yearly average of the rideability and safety should be the criterion for judging a well-maintained gravel road. We must begin dragging and floating operations as soon as the heavy traffic begins and continue through its duration, on the theory that a small hole is easier to fill than a large one and that small chatter bumps are easier to control than large ones.

The trouble with the entire gravel road situation is that we are taking loose-surface roads and attempting to arrive at the Utopia of a consolidated surface with the common error of calling it a stabilized road. With the present speed of the automobile and with the suction of balloon tires, this is impossible; and the gravel surface must be placed where it rightfully belongs—that is, on roads carrying no great amount of high-speed traffic.



## ROADSIDE TABLES

You hear a great deal about roadside tables. Don't misunderstand me, I am 100 per cent for the roadside tables; but what about the roadside breakfast, dinner, and supper tables of our far-flung farmers and settlers?

All the talk of vehicle miles, graph design, relative importance or lack of importance, and the theory that a road should be abandoned because it shows up on the red side of the ledger is all bosh and humbug to me. Doesn't any great business in the world in its expansion first go into the red side of the ledger before it pays out on the black? Aren't all operations in an automobile factory on the red side of the ledger until the automobile is actually sold?

Is the road business very different from any other business? I think not. There are many operations in business—for instance, millions spent in research—that are always a red figure and must be charged out by the paying black. Our outlying roads in hundreds of cases have been our research department.

Do you suppose the farmer who sells his produce at a low level and buys back his supplies at a high level cares whether the road surface has been designed by chart, graph, or vehicle miles? He knows that if he has to haul his produce through the mud, he is getting less for his produce than his neighbor on an all-weather road, because it costs him more to get to market. Is it fair to say that all the outlying roadside tables should be moved out to the trunk lines because the trunk lines carry 75 per cent of the vehicle miles?

Yes, there is social design along with physical design. The basic physical design of the drawing board does not always fill the bill as to the economic needs.

I also feel very keenly on the problem of financial design; and any solution to this perplexing problem based on political selfishness, personal ambitions, greed, envy, hatred, or malice, will *not* be a lasting solution to the problem, but will be seriously detrimental to a favorable public opinion and to the future of good roads.

There are 80,606 miles of county roads in the State of Michigan; they would reach three times around the world at the equator and have enough left to tie a healthy knot. These 80,606 miles of road represent the basic foundation of far-flung Michigan, from the mines of the north to the urban areas of the south and over the great fruit districts of the east and west, with the tourist traffic encircling the whole. The 2,877,000 miles of county and township roads throughout the United States serve the small divisions of our society, the basic structure of our democracy, without which our government cannot survive.

## PARKS

Closely linked with our road system and supported by our regular gas- and weight- and property-tax monies is our system of parks. In Gogebic County we have eight larger parks totaling 2,624 acres situated in virgin timber, and five smaller undeveloped roadside parks, over a hundred roadside tables, and outlooks at various points of interest in the county. Four of the parks are situated on the shore of Lake Superior.

The Black River Park and Parkway is at the present time our most remarkable development, with beautiful gorges, falls, and cascades in settings of primeval forest that will remain forever as a gift from the people of Gogebic County to posterity. When the entire land acquisition has been completed, the Black River Park will be seven miles long and about one mile wide and will contain about 3,000 acres. The Black River has cut its path along the great Black River faults from the oldest rocks in the world, the Archaean granites, on the south through the present iron formation, and then into the native copper formations, the only formations of their kind in the world, over the Neepikon Gorge, and the Sandstone and Rainbow Falls, through the primeval forests and into Lake Superior, the great lake of Gitchigumee, the largest body of fresh water in the world.

Our Presque Isle River Park, as yet undeveloped and inaccessible by road, will rival the Black River Park and will consist of 1,000 acres when land acquisition has been completed.

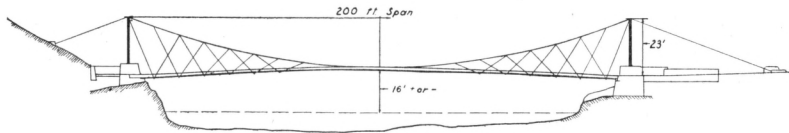
It is a beautiful spot where the Presque Isle River, in geological ages, has cut a beautiful and picturesque canyon into the great sandstone and conglomerate rock. It is filled with Indian lore. There the tribes came for centuries to make maple sugar in the beautiful sugar groves; it was a hunting ground of the Chippewa Tribe.

Just above the point where the old and the new mouths join and the river widens, the larger and more beautiful falls can be seen—roaring and awe-inspiring over the cascades of sandstone during high water, but quiet and peaceful during low water. For three miles up the river there is nothing but one continuous rapid cascade and falls, one after the other. The explorer, on pursuing his way up the river, cannot but stand and gaze in awe at the weird formations of the sandstone. He sees how the pebbles lodging in a depression in the sandstone and swirled round and round by the rushing waters form natural circular basins in the rock, as perfect as could be made by hand and in the bottom of which one still finds the pebbles. No doubt countless pebbles were used by Mother Nature in gouging out those basins. As the ages roll by and the river recedes or changes its course, these basins are again filled with sand, which hardens and causes the circular, dollar-like formations so commonly seen in cut sandstone.

As one stands and gazes at the beautiful virgin forests surrounding him and sees the river falling away in the distance below, or becoming lost in the folding arms of the lofty pines, he realizes that these beautiful trees were not put there for the lumberman's axe, and, drawing a deep breath of its wonderful fragrance, swears he will fight for them and preserve their natural beauty for the coming generations.

### A UNIQUE SUSPENSION BRIDGE

In our Black River Park we have a unique foot-bridge of the suspension type spanning the Black River. It is 200 feet long with a 16-foot clearance over the river. This bridge was placed in a ravine where the storms of Lake Superior could reach it, and the problem was to develop a non-sway bridge, one that would be unaffected by the action of the wind. We first made a model of the usual suspension-bridge type and found that we would have too much sway. After experimenting with all kinds of suspenders and suspension angles, we finally hit upon a design that we call a "diagonally-suspended, flared-cable,



Elevation of pedestrian suspension bridge in county park. Note diagonal suspenders.

suspension bridge." To my knowledge there is not another bridge in the world of this type of construction. Instead of supporting the cables in the usual vertical plane, we flared the cables from the tower to their anchors to a spread of 11'4" and then drew them in to a spread of 6' in the center of the span. Instead of the customary vertical suspenders for the floor, we used continuous diagonal suspenders. These set up alternate triangles of force, which help brace the bridge against the action of the wind. This design conforms with the usually accepted practice that the ratio of width to length of a suspension bridge should be approximately 1 to 35. We have had some terrific gales since the erection of this bridge and at no time have we found any side sway, and there is a minimum of vertical sway as you walk across the bridge. The 23-foot towers and the floor are of timber construction to conform with the natural beauties of our forests. This bridge was built at a cost of approximately \$10,000. For seven miles from the main road down to the park, we have acquired a 400-foot right-of-way through the primeval forest.

## WIDE RIGHT-OF-WAY

What are we doing to save trees in our own communities? Perhaps we have tried to save a few of our roadside trees; but our many miles of treeless roadsides are unsightly tributes to the fact that we have scarcely tackled this problem. Every road should have its protection of trees. It requires such little effort to plant the roadsides that I cannot understand why we do not have a definite program throughout the United States and make yearly appropriations definitely earmarked for the actual planting of every foot of the rights-of-way, no matter how far-flung they may be.

A few years ago it became my lot to supervise the cutting of virgin timber, to make way for new roads required by increasing automobile traffic. We realized, too late, that the entire right-of-way, even on the old four-rod widths need not be cut out. We began saving the trees just outside the cuts or fills. We decided to replant our mistakes; thousands of seedlings were set out in long furrows. Eight-year-old trees purchased from Michigan State College were also set out and left to themselves to grow.

You have often heard that it is an ill wind that does not blow someone some good. Unfortunately for the world, but fortunately for our roadsides, when the great depression swept unsuspecting men from their feet, then came the long trek through my office of men who were afraid of the future and the welfare of their families: men who came, some with polite, respectful requests; other with defiance and hatred, looking for work. We turned them out along our roads to extend greatly our roadside planting.

I remember a pale, frail-looking dry-goods store manager who came into my office and begged for work. I looked at his hands—white and soft—his face pale from inside employment. I asked if he thought he could stand outside work, and he said *he had to stand it*—it wasn't a case of whether he could or not, he must. I asked him if he could be trusted to work alone, and he definitely stated that he could. I placed him out among the eight-year-old scotch pine, with a hoe, and told him to save them from being choked by the weeds, by cultivating around them, taking care not to harm the life that seemed so weak and frail. He did so with the same energy that had placed him in the manager's job, which he lost through no fault of his own, and the miracle of nature immediately took place. The trees sprang into a newness of life that was surprising, and they now stand as beautiful roadside friends of mine and yours, if you care to pause in your 60-mile-an-hour speed long enough to observe them. Trees were then brought in from the neighboring forests and fields—thousands upon thousands—until we have counted upwards of a half million or more that seemed lost on the vast area in need of planting.



A sheltered road.

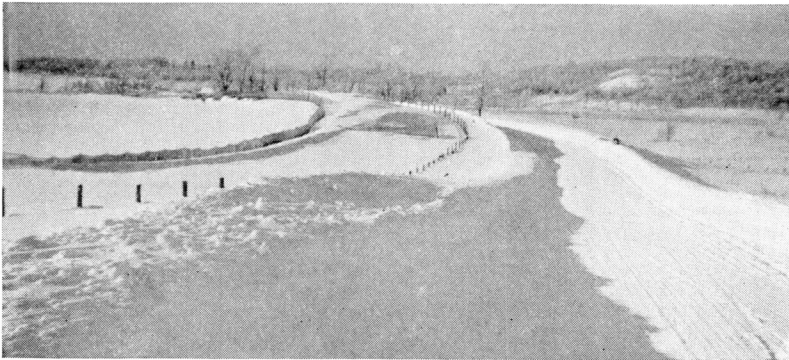
Sixty trees to a hundred feet on one side give adequate protection to the roads. More, of course, are needed to grow the more natural-looking road shelters. Sixty trees on every hundred feet of roadside or 6,360 trees a mile will pay dividends, the stock of which will bring millions of buyers, if judged on the basis of a good investment yesterday, and more if on the basis of a good investment today. The returns are beyond our dreams!



Windswept road, narrow grade, not protected by snow fence.

I like to divide roads into three classes: (a) sheltered roads, (b) semi-sheltered roads, (c) windswept roads.

But wait, you say, we live in a highly-specialized farming country while you are discussing your roadsides in the forests. Well, let us discuss briefly the Indiana acreages, yields, season prices, and total values for the past 10 years of the crops of corn, wheat, oats, barley, clover, timothy hay, alfalfa hay, and rye. From the Annual Crop Summary of Indiana published by the United States Department of Agriculture in co-operation with your University, I find that the price of the average yield for the last ten years on corn, wheat, oats, barley, rye, and buckwheat was \$11.28 per acre. Keep that figure in mind! Experience has taught us that a 150-foot right-of-way will provide enough room to shelter our roads. This allows from



Windswept road protected by snow fence.

40 to 60 feet for the roadbed and ditches, leaving from 90 to 100 feet, or about 10 acres per mile, of actual available planting area.

The following comparative figures may start you thinking and help to make you tree-and-shrub conscious.

Reducing these costs to a per mile basis and comparing the cost of maintaining a sheltered road with similar costs on a windswept road under the same traffic count shows some surprising results.

	<i>Sheltered</i>	<i>Windswept</i>	<i>Perpetual Excess Cost</i>
Snow plowing .....	\$55 to \$75	\$181-\$350	\$106
Snow fence (allowing only 1,000 feet per mile) .....		32	32
Dragging (surface maintenance) .....	168	281	113
Gravel loss .....	600	750	150
Dust layer .....	125	220	75
Total annual saving per mile			\$476

Add to all of this the asthetic value and economic saving from never having a blocked road in a sheltered area. The snow plow can always go through.

But you say we have little or no snow cost, and we do not place a dust layer on our roads. All right, let's deduct the dust layer and snowplowing costs.

Annual Cost	\$476.00	per mile when highest type of maintenance service is given.
Subtract	75.00	dust layer
	<hr/>	
	\$401.00	
Subtract	106.00	average saving in snowplowing on basis of 150 inches of snow.
	<hr/>	
	\$295.00	
Subtract	32.00	eliminating all artificial snow fence.
	<hr/>	
Net saving of	\$263.00	per mile, or \$26.30 per acre based on 10 acres of planting per mile.

Now you say we cannot give the highest type of maintenance because we lack funds. That is the best argument for sheltered roads. If we do not have enough money to maintain our roads properly, and none of us have, then should we not shelter them, thus automatically cutting down on the maintenance services required?

Since the saving of \$26.00 per acre is based on the highest type of maintenance and we can't give our roads this type of maintenance because of lack of funds, let's reduce the maintenance cost by one half. By giving our roads only bare necessities, we are still saving \$13.00 per acre of available planting area inside the right-of-way.

The gross yield of your corn, wheat, oats, barley, rye, and buckwheat crop is only \$11.28 per acre. Remember that I am comparing the savings of a sheltered road directly against the actual gross crop yield. Think of the hundreds and hundreds of miles of roads that have no crop yield adjacent. Averaging these non-producing road miles with the crop-yield areas will further reduce the average price yield of the roadside acreage and increase in comparison the actual savings of a sheltered road.

But what is the net price yield to the farmer, subtracting his seed, labor, and harvesting? I will let you who are better informed subtract those figures, which will reduce the price yield to a figure still lower than the cost of adequate maintenance. Do not these deductions give you some food for thought? Do they not prove in a clear and understandable manner that the forest crop on wider rights-of-way pays large dividends? I know that a forest crop on our roadsides on a sheltered road pays by *far* the largest dividend as compared to a windswept road.



In my county it would be a financial impossibility to maintain our winter road service if it were not for our sheltered areas. We have definite proof of this statement because all the taxes combined that are raised in one of my townships do not even pay for the snowplowing service in that district.

Wide rights-of-way cost a great deal; but the terrible catastrophe where entire farms were blown away in the great dust bowl would never have happened with adequate sheltered areas for windbreak protection. Windswept farms are costing the farmers of the nation millions of dollars, and windswept roads are costing the entire nation millions of dollars.

Summarizing, we should have sheltered roads:

1. For general windbreaks.
2. For moisture retention in summer and winter.
3. For wild-life protection. It is said that farms could not exist one year if the birds were not our friends.
4. For stock shelter.
5. For ultimate timber crops from mature trees.
6. For military protection in emergencies.
7. For a perpetual yearly saving in actual road maintenance both in winter and in summer.

## DISCUSSION OF COUNTY ROAD ORGANIZATION

H. J. Schnitzius,

Landscape Supervisor, State Highway Commission  
of Indiana

I am not qualified to discuss the county-road-organization comparison revealed by Mr. Koronski's discussion—but any set-up that permits a qualified engineer or technical expert to be protected in his work has elements of common-sense government.

In reference to the snow problem, Mr. Koronski discussed an annual snowfall of 150 inches. The average at Indianapolis is 22 inches and that at LaPorte, the area of our greatest snowfall, about 50 inches.

On the subject of "loose-surface" road, our maintenance department has proved one point beyond all doubt—that the program of raising secondary roads from the status of "drag-surface" maintenance to a stabilized-surface road by a well-planned, long-term "stage-construction" program has been the reason why, on an increasing mileage, maintenance can be carried on with the same amount of funds each year.

In talking of the economy of a primary or secondary road, one is usually discussing only the paved strip. The greater the length to which a false economy of limited right-of-way and stinted design of grade is carried out, the greater becomes the amount of maintenance money needed to maintain that road.